U.S. DEPARTMENT OF COMMERCE
National Telecommunications & Information Administration

Evaluation of the
Telecommunications and Information Infrastructure Assistance Program

Case Study Report

Middle Schools Online
96043

Towson, Maryland

Site Visitors: Gary Silverstein and Nicole Bartfai

Dates of Visit: March 26, 1999

PREFACE

The following case study report is being issued as part of TIIAP's ongoing evaluation initiatives designed to learn about the effects of TIIAP funded projects. This report is one in a series of twelve based on in-depth case studies conducted in 1999 to study three subjects: (1) issues particular to rural communities (2) issues particular to urban communities, and (3) challenges in sustaining information technology-based projects. The case study reports give us evidence about the special challenges that each project faced and provide information for a better understanding of factors that can facilitate the success of such projects.

In addition to being urban or rural, the case study projects were selected because they involved distressed communities, represented innovative models for services, and affected measurable community outcomes. The case studies, conducted under contract by Westat, an independent research firm, consisted of extensive review of project files and records, interviews with project staff, representatives of partner organizations, and project end users. In addition to the 12 individual reports, a summary of findings across the projects is also available on the NTIA website.

NTIA wishes to thank the case study participants for their time and their willingness to share not only successes but also difficulties. Most of all, we applaud your pioneering efforts to bring the benefits of advanced telecommunications and information technologies to communities in need. We are excited about the case studies and the lessons they contain. We believe that these projects provide a unique insight into the variety of ways to eliminate "the digital divide" which exists in our nation. It is through the dissemination of these lessons that we can extend the dividends of TIIAP funded projects nationwide.

We hope you find this case study report valuable. You may obtain other case study reports, a summary of findings of the collected case studies, and other TIIAP publications through the NTIA website (www.ntia.doc.gov) or by calling the TIIAP office at (202) 482-2048. We also are interested in your feedback. If you have comments on this, or other reports, or suggestions on how TIIAP can better provide information on the results and lesson of its grants, please contact Francine E. Jefferson, Ph.D., at (202) 482-2048 or by email at fjefferson@ntia.doc.gov.

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Project Name	Middle Schools Online
City/State	Towson, Maryland
Grant Recipient	Baltimore County Public Schools
OEAM Number	96043
Application Area	Education, Culture, and Lifelong Learning
TIIAP Grant Amount	$104,499
Match Amount	$217,853
Date of Site Visit	March 26, 1999
Site Visitor(s)	Gary Silverstein, Nicole Bartfai
Abstract	The decision to apply for TIIAP funding reflected the school district's need to devise a cost-effective approach for getting donated computers into the hands of low-income students who were most likely to benefit from increased access to online services. The participating families received a computer, modem, dedicated telephone line for Internet access, printer, and Internet account. Students and parents also received individualized and group training in how to operate computers and navigate the Internet. Twenty-nine families received donated computers (the school sent home a survey with all seventh grade students—only 30-35 families expressed interest in receiving a donated computer). By the time of the site visit, 18 of the 29 families that received donated equipment were still participating in the project (all of these 18 students had graduated to high school), 10 families had moved, and 1 had been removed from the project for inappropriate use of the equipment. The project—conducted at a single middle school—encountered considerable problems with the donated equipment. These technical problems delayed the implementation schedule and limited the project's overall effectiveness. Baltimore County Public Schools staff indicated that, based on their experiences, they would recommend that other communities adopt a modified version of their approach. Rather than dispersing equipment across several classes and subjects, they suggested that donated computers be provided to a focused "team" of students, e.g., an entire English class. This would enable teachers to prepare lesson plans and homework that are designed to take full advantage of the Internet and e-mail. They also recommended that future projects develop minimum standards for donated equipment—including written provisions for what will happen if machines break down.

A. Background

Community Characteristics

The project was conducted in Baltimore County, Maryland, a large and diverse county that is contiguous to Baltimore City on three sides. According to the project's original proposal:

> Like other counties throughout the country that border major cities, Baltimore County is becoming increasingly urbanized and is experiencing the economic and social problems characteristic of large cities, while it continues to have suburban and rural areas. Median income in the 1990 Census ranged from $10,000 to $136,000 among Census tracts. Baltimore County was 15 percent minority at the time of the 1990 Census.

The project focused on students at the Lansdowne Middle School (LMS). This school was selected because its population included a high percentage of low-income families that lacked access to the information infrastructure. Specifically:

- Among its 701 students (July 1996), 54 percent qualified for free or reduced-price lunch—the highest middle school percentages in Baltimore County.
- LMS is located in a neighborhood where the median income is approximately $15,000.
- The school's eighth grade students scored well below satisfactory in all content areas (reading, mathematics, social studies, science, writing, language usage) on the state's performance assessment program tests in 1995.
- At the time the project began, less than 10 percent of students had access to computers at home. Even fewer had access to online services. In addition, LMS was not networked and there was only one dedicated phone line for online access.

Project Overview

The project was designed to "test the effectiveness of providing telecommunication connections between school, home and the public library to improve student achievement"

(Application to TIIAP, April 3, 1996). According to project staff, the idea for the project came about because the Baltimore County Public Schools (BCPS) was receiving donated 386 computers from a local foundation. The decision to apply for TIIAP funding reflected the school district's need to devise a cost-effective approach for getting these donated machines into the hands of low-income students who were most likely to benefit from increased access to online services.

The "Electronic School to Home" project was used to link 29 seventh grade students and their parents to school and library resources via the Internet.[1] Participating families received an Intel 386 (or better) computer, a modem (28.8 baud), a dedicated telephone line for Internet access, a printer, and an Internet account. Each home computer was configured to run Netscape (2.0 or better), Microsoft Works, and SurfWatch. Students and parents also received individualized and group training in how to operate computers and navigate the Internet. Students were expected to use the donated computers to access curriculum information, prepare and submit (via e-mail) homework assignments, and communicate (via e-mail) with friends and teachers. Potential uses for parents included communicating via e-mail with teachers, receiving information on Parent Teacher Association (PTA) activities, reviewing student work samples, and accessing information on other school activities.

The project was also used to enhance the computer facilities at the LMS library. Project funds were used to obtain a server, seven computers, and a printer. Macintosh Power PC 5400 computers were joined by a network server and connected to a laser printer in the school's mini-computer lab in the library. In addition, this mini-lab configuration was provided ISDN access. Participating teachers at LMS received training in the use of the Internet, the World Wide Web browser, Netscape, and e-mail. They also received SLIP/PPP accounts from the Baltimore County Public Library.

The resulting system was designed to integrate the services provided by the BCPS and the public library with the resources available through the Internet. The primary objective was to assess the extent to which providing families with donated computers would lead to an improvement in student achievement, motivation, and attendance. A secondary goal was to assess whether parents who received donated equipment would increase their contact with the school, as well as their level of participation in their children's learning.

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[1] As is discussed later, the project originally intended to provide donated equipment to 30 families. However, one of the families selected to participate in the project moved before the equipment was installed. At the time of the site visit, 18 families were still participating in the project.

Project Status at the Time of the Site Visit

The project was still in operation at the time of the site visit. Eighteen of the 29 families that received donated equipment were still participating in the project, 10 families had moved, and 1 had been removed from the project for inappropriate use of the equipment. By the time of the site visit, the 18 participating students had moved on to a BCPS high school that serves as a business magnet school with a technology focus. The principal at this high school is interested in helping students continue their online activities. In January 1999, BCPS staff met with the high school principal to describe the project and state their commitment to continue the project with those 18 students at the high school. BCPS staff indicated that the principal was extremely supportive and excited about the project. During this time, BCPS staff also met with the high school's guidance counselor, who promised to schedule the 18 students in at least one common class during the next school year. At the time of the site visit, the project was in the process of upgrading the donated computers in the homes of the 18 families.

The TIIAP-funded computer lab was the first networked lab at LMS and resulted in two additional labs being built at the school. The science teacher/technology liaison and the media specialist, who participated in the project and were interviewed during the site visit, have been long-time users and advocates of integrating computers in the classroom. They commented that teachers use the machines for instruction, research, and, because of the network, e-mail. Despite the fact that the lab is networked and teachers have e-mail accounts, using e-mail for communication between students and teachers is minimal or nonexistent.

At the time of the site visit, BCPS was operating under an extension[2] from TIIAP to assure that all of the donated equipment was in working order before the project officially expired. BCPS is hoping to maintain the families' Internet connections. The school district is currently looking to a local company to donate cable connections to the families for Internet connection (as an alternative, the district also plans to ask Bell Atlantic to donate the cost for the next 3 years). As the project closes, BCPS was also planning to provide a Citrix server to connect the 18 families to a common software vendor for both Internet access and software applications. This product greatly enhances the capacity of low-end computers to access the Internet. Finally, BCPS

[2] As is discussed later, this extension was necessitated by a combination of factors-—e.g., poor quality of the donated equipment, death of the principal at LMS—that hindered the project's ability to remain on schedule.

was planning to use the extension to obtain detailed information from the 18 families about the extent to which they have continued to use their donated equipment.

B. Community Involvement

Characteristics of the Grant Recipient Organization

The project was designed by the Baltimore County Public Schools' Office of Educational Technology. At the time of the application, BCPS was the nation's 22nd largest school system, serving over 100,000 students in 100 elementary, 26 middle, and 24 high schools. Prior to applying for a TIIAP grant, the BCPS, in collaboration with other organizations (i.e., Bell Atlantic, Microsoft, the Xerox Corporation, Baltimore Gas and Electric, the Foundation for Educational Innovation, Maryland State Department of Education, State of Maryland), had leveraged $2.9 million to install computers with 64K ISDN lines into the homes of 100 third grade students in a local elementary school.

On the TIIAP project, BCPS was responsible for selecting the school that would participate in the computer donation program. In addition, BCPS provided training to the teachers and families who were selected to participate in the project (other teachers and students were also able to attend the group training sessions). Finally, BCPS was responsible for receiving the donated equipment, installing the computers in the homes of participating families, and performing repairs as needed. The grant recipient hired a new part-time employee who was responsible for installing the computers in the homes of participating families; fixing the donated equipment; providing training to students, parents, and teachers; and generating community support for the project.

As is discussed later, BCPS staff provided staff at Lansdowne Middle School with considerable discretion in (1) selecting the participating teachers and families, and (2) determining the manner in which computers would be integrated into the students' normal learning routine. After the initial meeting with the school principal, this decision was made because all Baltimore County public schools practice site-based management and BCPS staff firmly believe in providing schools the autonomy to make school-related decisions.

Partnerships

The proposal was developed with the involvement and support of several county and state-level organizations. In addition to LMS, BCPS entered into formal partnerships with the following entities:

- **Baltimore County Public Library.** The Baltimore County Public Library (BCPL) served the project in two ways. First, the BCPL used its own services to donate ISP connections for the 29 families that received donated equipment. Second, BCPS staff used library facilities to conduct group training sessions for LMS students and their families. The library was available during the weekend hours and was easily accessible to the community. The library also publicized these training sessions and made them available to all community members, not just LMS students and parents. It should be noted that when the project was awarded, BCPS technology staff already had a good working relationship with representatives from the county library system. For example, the BCPL had been providing training and serving as a point of access for community residents who wanted to use the Internet.

- **The Phoenix Foundation.** The Phoenix Foundation, which was run by the former president of the Maryland State Department of Education, provided the computers that were donated to the 29 families. Phoenix had a good reputation as a company that provided refurbished equipment and had previously provided donated equipment to other Maryland State Department of Education projects.

- **Maryland State Department of Education.** The Director of Partnership Programs at the Maryland State Department of Education (MSDE) was responsible for coordinating access to the computers donated by the Phoenix Foundation.

- **Bell Atlantic.** Bell Atlantic donated the installation cost, approximately $100, for installing a second phone line that participating families used to connect to the Internet. Bell Atlantic and BCPS had a pre-established working relationship, and at the request of BCPS, Bell Atlantic was willing to donate installation costs.

Finally, BCPS staff reported that Title I funds were used to provide each of the participating families with printers and other materials. This was an unexpected benefit, since the original proposal did not include any provision for equipping families with printers.

Community Outreach

The project was conceived without any input from the county's schools and other community stakeholders. However, once the school was selected and the project was awarded, the staff at LMS were provided considerable latitude in how best to select participating families and make use of the equipment.

The project's decision to focus on seventh grade students reflected three primary factors. First, eighth grade is the highest grade that participates in the Maryland School Performance Assessment Program. At the time of the proposal to TIIAP, BCPS staff decided that scores from these standardized tests would be used to assess the project's impact on student learning (as is discussed later, this approach was later determined to be unfeasible). Second, BCPS staff were concerned about findings on a recent survey that indicated students' use of public libraries decreases after they leave elementary school (while at the same time, their need for resources to complete school assignments increases). Third, BCPS had already tested a similar approach with elementary school students. As such, BCPS staff wanted to assess the impact of providing donated computers to older students.

BCPS staff indicated that they did not formally survey the county's schools to assess their relative interest in participating in the project. Rather, the principal at LMS was approached about whether he was interested in taking on the project. LMS was selected for several reasons. First, its population typified the student needs that the BCPS was trying to address. Specifically, the school was located in a neighborhood with a median income of approximately $15,000. Among the school's 701 students, 54 percent qualified for free or reduced-price lunches—the highest percentage for middle schools in Baltimore County. The school's eighth grade students scored well below satisfactory in all content areas (reading, mathematics, social studies, science, writing, language usage) on the state's performance assessment program in 1995. Second, at the time the project began, less than 10 percent of students had access to computers at home. An even smaller percentage had access to online services. LMS was not networked, and there was only one dedicated phone line for online access. Third, BCPS staff indicated that the TIIAP grant provided a timely opportunity to implement a high profile project in a neighborhood that traditionally felt ignored by the school system (the project to install computers in the homes of 100 third graders was located on the other side of the county). Finally, the principal at LMS was known for aggressively promoting life achievement among his students. In addition, he was viewed as being interested in and supportive of using technology to augment students' classroom experiences.

Project Outreach

At the outset of the project, BCPS determined it only had enough equipment and manpower (e.g., staff to install and fix computers) to support approximately 30 families. It was therefore necessary to limit the number of students who would be able to participate in the project. Once the project was awarded, LMS sent a survey home with all seventh grade students to assess families' interest in and feasibility to receive donated computers. Only 30-35 families responded to the survey. (It is important to note that this project was conceived and implemented at a time when use of the Internet was less widespread. Were the project to be replicated today, it is likely that considerably more families would have expressed interest in receiving a donated computer.) It took LMS staff approximately 6 weeks to identify the 30 families that would participate in the project.

Both LMS staff and BCPS staff recalled that the principal had established guidelines for selecting students, but neither party was sure as to the exact specifications.[3] Interested students were expected to answer a series of questions concerning their use of computers (e.g., Do you currently have a computer at your home? Would you have a place for the computer?). Students were also asked to write an essay about how they would use a computer if it was placed in their home. LMS indicated that the survey answers were used to determine which families would receive donated equipment. Despite the predetermined selection criteria, project staff at both BCPS and LMS indicated that most students who returned the survey were given computers because only 30-35 students returned the survey.

Of the 29 students who were selected to participate in the project, 15 were male and 14 were female. In addition, 27 were white and 2 were Asian American.

The principal at LMS also had primary responsibility for identifying the teachers who would work on the project. According to BCPS staff, the principal knew his staff and selected teachers who expressed an interest in working with the participating families and on the particular project. One of the selected teachers commented that the principal tried to pick seventh grade teachers who were in one team that included a teacher from each of the four main discipline

[3] The principal died during the project. Interviews with LMS staff were used to understand the process that the principal used to design and implement the project.

areas. Due to delays in getting the equipment operational in the homes, the selected teachers had little time to work with the students while they had operational computers.

BCPS staff indicated that they intentionally left it to LMS staff to develop a process and corresponding criteria for selecting the teachers and families to participate in the project. This was done for several reasons. First, the project was implemented at a time when the county was getting started with site-based management. As such, it was important that the school take responsibility for making and implementing these decisions. Second, the principal was well respected by the community and knew the parents, students, and teachers. BCPS staff indicated that the principal wanted to improve the school and community relationship and one way to accomplish this was by promoting positive experiences for the students, inside and outside the classroom.

Training

In addition to providing families with donated equipment, the project was used to provide students and their parents with extensive training in how to operate computers and navigate the Internet. This training was initially provided to each of the individual families at the time the computer was installed in their homes. The initial in-home training sessions—conducted by the BCPS trainer hired for the project—were used to install the hardware, configure the software, and provide general instruction in computer usage. From the outset, students were encouraged to use e-mail to communicate with family, friends, and teachers (BCPS staff viewed e-mail as an incentive that would get students and families interested in using their new computers). BCPS staff noted that parents were initially interested in learning about how to use their keyboards, in large part to increase their employability. In response to this unanticipated need, the project purchased software designed to get users comfortable with using computer keyboards.

With approximately 70 percent of the in-home computers down at any given time, the BCPS trainer was frequently making home visits to troubleshoot the donated equipment. While on site, this individual also provided training to students and their families. As the project progressed, it became clear that providing in-home training was both costly and time consuming. For example, it became increasingly difficult to schedule 29 home visits in a timely manner. To overcome this obstacle, the project eventually emphasized group training sessions for students at two sites—the school's computer lab and the neighborhood branch of the public library. However, BCPS staff indicated that participants did not express much interest in group training. Families preferred the one-on-one sessions, and BCPS staff agreed that a more personalized approach was important

early on when individuals were less familiar with their new computers. LMS teachers and families indicated that the one-on-one training not only provided technical training on the use of the computer, but also provided students with some specialized attention (teachers noted that these students were generally not used to receiving such personalized assistance).

Training was provided in the school lab every Wednesday for students and parents involved in the program. Some of the training sessions were offered after school, and others took place during school hours. Although students could take a "late" bus home, BCPS staff indicated that these sessions, especially later in the program, were not well attended by students or their families. Additional training sessions for all interested members of the community were held at the public library. The BCPS trainer and the school's media specialist also held group training sessions at LMS for participating teachers (and other faculty members) on how to use the Internet and e-mail. The BCPS trainer also served as a help desk by providing families with ongoing technical assistance over the phone or via e-mail.

Protecting Privacy

In order to assure that communications between the school and participating homes remained confidential, each user was assigned a unique password for gaining access to the system. In an effort to assure that the equipment was used for its intended purpose, the BCPS trainer provided an educational program and guidelines for effective and proper use of the Internet connection. In addition, at the outset of the project, participating parents were required to sign an acceptable use statement. This policy stated that their donated computers would only be used for educational purposes (the BCPS had been working on an acceptable use policy prior to the grant, and these guidelines were eventually adopted for use by the project). The public library and the school computer lab also required users to sign a similar statement.

As the project progressed, 1 of the 29 families was required to return its donated computer when the student was found to be in violation of this policy. This was determined when, upon answering a repair call at the home, the BCPS trainer accessed the cache memory of Internet sites and realized that the student had been viewing and sending inappropriate material. The principal made the decision to remove the computer.

C. Evaluation and Dissemination

Evaluation

The BSPS proposal to TIIAP delineated an impressive plan for evaluating whether the provision of donated computers led to positive changes in student performance. Specifically, the project intended to use the following data to assess trends for participating and nonparticipating students:

- **Improved student achievement.** BCPS intended to compare pre-treatment (fifth grade) and post-treatment (eighth grade) scores on a series of standardized tests administered through the Maryland School Performance Assessment Program (MSPAP). These scores were to be supplemented by portfolios that contained samples of work that participating students completed by using the Internet or other project-related technologies.

n At the time of the site visit, BCPS staff indicated that this approach was not feasible since it was not possible to obtain MSPAP scores for individual students. Even if these data had been available for individual students, BCPS staff indicated that two other barriers would have likely precluded their use of MSPAP data. First, delays in getting working computers into the hands of participating students would likely have negated any of the short-term gains that were expected to have materialized as a result of the project (see Section D for a discussion of the delays that were experienced as a result of the poor quality of the donated equipment). Second, the project experienced further delays when the principal died suddenly.

- **Improved student attendance.** BCPS also intended to use administrative records to assess whether there was any improvement in attendance rates among participating students. At the time of the site visit, this approach had not been used to learn about any possible impact on participating students.

- **Improved behavior in school.** Finally, BCPS intended to use the school's disciplinary records, supplemented by teachers' observations and anecdotal reports, to assess whether the project resulted in any improvements in school behavior. At the time of the site visit, this approach had not been used to learn about any possible impact on students.

The proposal identified evaluation tools (e.g., logs of the number of times that students and parents used the system) that would be used to assess the project's impact and effectiveness. These tools were not used, and BCPS staff indicated that for much of the project, their time and energy were focused on getting operational computers into the homes of the

families, rather than on the evaluation requirements. LMS staff also indicated that they received little direction from BCPS staff as to evaluation requirements and therefore did not initiate any of the evaluation procedures outlined in the proposal.

In hindsight, BCPS staff indicated that they would not have emphasized the use of test scores to assess the project's impact. Aside from the project's inability to obtain scores for individual students, BCPS admitted that it might have been unrealistic to expect dramatic gains on standardized tests as a result of single and short-term intervention. Instead, staff suggested that they should have focused on whether (1) there was an increase in students' and parents' use of computers; (2) students and their parents became increasingly sophisticated in their use of computers and the Internet; and (3) students achieved such intermediate outcomes as improved attendance, improved graduation rates, and improved grades.

Dissemination

Information about the project was disseminated at state department of education meetings and at state technology association meetings. BCPS staff also presented "Middle Schools Online: The School, Home and Public Library" at an Association for Supervision and Curriculum Development conference. No future presentations are currently planned and no effort is being made to disseminate information through ERIC or the Johns Hopkins University's Center for Technology in Education, as was described in the original proposal.

BCPS has received several calls from other institutions looking to submit TIIAP proposals. The most commonly discussed topics include (1) the use of donated equipment, (2) the grant writing process, (3) the impact on middle school students, and (4) why the particular grade span was selected. Prior to submitting the grant, BCPS staff investigated other projects implementing a similar approach—placing computers in the homes of students. One project, located in Union City, NJ, provided new computers to the students and had a full-time staff member to implement the project. BCPS staff indicated that this was impossible for BCPS to replicate and began looking at the alternative of using donated equipment.

D. Problems Encountered

Technology

The project was designed to test the feasibility of using donated computers to link low-income families with the information infrastructure. From the outset, however, BCPS experienced considerable technical difficulties associated with its reliance on used equipment. All of the refurbished computers that were initially installed in the homes required considerable repairs. As a result, BCPS staff had to expend considerable effort and resources into getting these machines up to industry standards. By the time of the site visit, extensive repairs had been made to all of the donated computers. In some cases, the original equipment had to be entirely replaced. In others, the donated computers required the installation of an entirely new or refurbished hard drive.

As the project progressed, families began to complain about the quality of the donated computers. BCPS staff indicated that these complaints started when students began noticing that the Internet connections in the LMS computer lab were considerable faster than what was possible on their home computers. BCPS noted that the faster pace observed by the students was primarily due to the fact that the LMS computer lab used an ISDN—as opposed to a modem—to access the Internet.

The extent of the hardware problems eventually forced BCPS to replace all of the problem computers. The experiences of the families varied. Both families that were interviewed only required a one-time "swap out" of their computers. Other families experienced ongoing problems, with some receiving as many as eight service calls. At the time of the site visit, BCPS staff were working to get upgraded computers in order to replace the current computers in the homes by the end of that school year.

BCPS staff also indicated that the BCPS trainer lacked the technical expertise to handle many of the repairs needed to keep the donated computers operational. This problem was exacerbated by the fact that the computers needed more technical work/repairs than originally envisioned. After the trainer left the project, BCPS technicians worked on the computers, but due to time and resource constraints, the BCPS technicians could not devote the time required to service the machines. More recently, BCPS has been forced to rely on outside contractors to maintain the equipment. At the time of the site visit, BCPS found an outside contractor that would be responsible for installing and connecting the machines and is currently scheduling the computers to be replaced.

Other technology-related issues are summarized below:

- BCPS indicated that its reliance on donated 386 computers led to another unanticipated problem—advances in technology since the project's inception have made it difficult for the project to find technicians who have the necessary parts and/or are willing to service older equipment.

- The use of outside contractors to handle repairs was complicated by the fact that the participating families had formal agreements with BCPS (as opposed to the repair firms). As such, contractors requested that they receive disclaimers of liability from families before going in to any private homes to make any repairs.

- Computers repaired at a BCPS facility did not always work when returned to the home environment. This raised the issue of the best venue for repairing computers, since home visits were more costly and time consuming.

- The donated computers were too slow to access the Internet in a timely manner. By the time of the site visit, BCPS had begun using Citrix—a web-based system that enables users' computers to function as terminals. Once fully implemented, this solution will enable all of the families to continue using their older equipment to access the Internet in a timely manner.

- Several of the families added their own software (e.g., games) to their computers. While this was not against BCPS policy (there had been no policy), the supplemental software slowed the operations of the donated equipment and led to other related malfunctions. BCPS indicated that, in hindsight, it would have configured the donated machines so that families could not install any additional software. Staff also indicated that they would have devoted additional resources to educating families about what they should and should not install on computers.

Process Used to Select Students

BCPS staff indicated that the decision by LMS to select students from across an entire grade level made it difficult for participating teachers to integrate learning technologies into their classroom activities. As such, none of the teachers altered their teaching practices or homework assignments (e.g., encouraging the use of the Internet to complete reports, requiring the use of graphics in papers and presentations), since only a few of their students had enhanced access to the Internet. This, in turn, limited the extent to which participating students were provided a structured framework for using the donated computers to complete their schoolwork.

In addition, the principal's death created a void that was never filled—especially since he was considered to have a vision of how teachers might integrate these new learning technologies into their classroom activities.

Attrition

As stated previously, the project began with 29 families 18 of which were still participating at the time of the site visit. Of the remaining 11 families, 10 had moved or their children were attending a different high school (the 11th student was required to return the computer due to unauthorized use of the equipment). BCPS staff indicated that, given the high level of mobility that characterized the neighborhood's residents, the percentage of families who had remained with the project (62 percent) was acceptable. Even those students who are no longer directly involved in the project have been able to keep the computer systems.

E. Project Outcomes

End Users

End users included (1) the students and families who received donated computers and participated in training, and (2) students and teachers at the school who used the LMS computer lab.

Among the 29 students/families, only 2 were interviewed during the site visit. Despite the overwhelming emphasis placed on the technical problems that occurred, both families were extremely grateful for the computers and Internet access (it should be noted that these two families indicated that they had fewer computer-related problems than the other families in the project). The most frequently used component was the Internet. The Internet connection provided both the students and parents access to information that was not easily accessible prior to the ISP service, for example, information for school projects, on vacation destinations, and about jobs. Both families emphasized how having access to the World Wide Web had changed the way in which they obtain information.

Project staff indicated that, to a lesser extent, two other applications—e-mail and word processing—were used by students/families. Early in the project, students and parents

received training on e-mail in hopes of increasing interest in using the machines. Although students and parents learned how to e-mail friends, family, and occasionally teachers, it was not considered as important to the families interviewed as having Internet access. The impact of e-mail on changing the way that they communicated (e.g., among themselves, with teachers, with friends, outside of the Baltimore metropolitan area) was more limited than the impact of the Internet. In general, parents became more interested in learning how to use their computer for word processing, e.g., to obtain skills that would improve their employability, and BCPS invested in software to provide instruction on word processing. The families interviewed stated that they used the word processing component but still felt Internet access was the most important aspect of the donated computers.

In addition to the students and parents with donated computers, all teachers and students at LMS were able to access the Internet at two sites—the school and the public library. Students indicated that they occasionally used the computers in the library, mainly in conjunction with training for the project. As long as the home computers were working, students and parents did not go to the public library to access the Internet. The school computer lab was used during school hours and also during training provided through the grant. The biggest advantage of the school computer lab was the speed of these machines compared to their machines at home.

Staff at LMS indicated that the school's students and teachers are continually using the computer lab. At the onset of the project, the media coordinator, along with the technical BCPS staff member who was hired to work with the families, provided training to teachers. The media specialist stated that the sessions were relatively well attended, and several members became extremely excited about the computer and the Internet capability. When the project was initiated, approximately 10 percent of the teachers were familiar with the Internet. By the time of the site visit, 70-80 percent of teachers were using the Internet for a variety of purposes.[4]

[4] These figures were estimates from the science teacher/technology liaison at the school and it is uncertain how much can be attributed to the grant-funded lab or the proliferation of the Internet.

Grant Recipient and Project Partners

BCPS staff clearly learned some important lessons about how similar initiatives might be structured (see Section G). However, as is discussed in the next section, it is too early to tell whether BCPS will apply these lessons in its own county.

The computer lab at LMS continues to operate as a resource and training facility for teachers and students. Training teachers in the use of technology continues to gather support from the district and state. LMS staff will therefore continue providing training opportunities. Student use is also considered important and will continue in the same capacity.

F. Sustainability and Project Expansion

Once the TIIAP grant has expired, BCPS staff plan to focus their attention on the donated computers that have been installed in the homes. At the time of the site visit, BCPS staff were planning to send technicians to the homes of the remaining participants to refurbish the equipment and connect them to the Citrix server. Project staff indicated that it was critical that the participating students have usable equipment that would take them through high school. They also plan to require more reporting from the students, such as how the equipment is being used, the frequency of use, etc. It was not clear whether BCPS will continue tracking these students after they have graduated from high school, e.g., to document how many students went to college or found employment.

Although it cannot replicate the TIIAP project without additional funding, BCPS hopes that as the cost of computers comes down, it will be easier to provide donated equipment to more families. In addition, BCPS is considering plans to develop a computer project at Dundalk Middle School.[5] The goal would be to (1) make sure that the students from Logan Elementary School who participated in the original project can continue to communicate via e-mail, and (2) provide training to other families (e.g., how to use the Internet). At the time of the site visit, no formal plan had been developed.

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[5] This is the school that received students from Logan Elementary School—the building that participated in BCPS's and Bell Atlantic's effort to install new computers in the homes of 100 third graders. Another elementary school that provided no computer access also feeds into this middle school.

BCPS also plans to work with IBM's Learning Village project, which creates web shells for each school where families can obtain homework information, view school calendars, and e-mail teachers. The system also provides an intra-school network for organizing instruction. Content would include national, state, and local curriculum and performance standards.

G. Lessons Learned and Recommendations for Other Communities

BCPS staff indicated that their project was a success in that it demonstrated the feasibility and benefits of placing donated computers in the homes of low-income families. However, they strongly emphasized that the project's design ultimately negated their efforts to assess how teachers can best take advantage of having donated computers in the homes of their students. This is because the teachers at LMS were not in a position to change their instructional practices when only one or two students in their classrooms suddenly had access to a home computer.

BCPS staff indicated that based on their experiences, they would recommend that other communities adopt a modified version of their approach. Rather than dispersing equipment across several classes and subjects, they suggested that donated computers be provided to a focused "team" of students, e.g., an entire English class. This would enable teachers to prepare lesson plans and homework that are designed to take full advantage of the Internet and e-mail. It would also make it easier for project staff to provide training to and track the progress of participating families. Staff also emphasized the importance of assuring early on that the administrative entity (e.g., BCPS) and all other stakeholders (e.g., participating teachers and families) have the same expectations as to what the project is designed to accomplish. BCPS staff also recommended that donated computers be provided to sixth graders (as opposed to seventh graders), since schools would then have 3 (as opposed to 2) years to work with a cohort of students.

With respect to assessing the impact of providing donated computers to low-income families, BCPS recommended that future projects first focus on obtaining basic information about students' computer usage, e.g., the extent to which it is becoming more sophisticated. They can also assess whether students' written communication skills are improving. In addition, BCPS staff recommended that future projects:

- Assess the effect that donated computers have on parents (e.g., increased attendance at PTA meetings, enhanced communication between parents and teachers).

- Do not attempt to assess the link between donated computers and grades or test scores (since short-term gains in student achievement could be due to such other factors as an excellent teacher).

- Communicate with parents ahead of time about any data collection requirements (e.g., usage logs) that families will be required to maintain in exchange for receiving donated equipment.

Other lessons learned by BCPS as a result of their participation in the TIIAP project are as follows:

Provide Initial Training in a Controlled Setting, Such as a Classroom or Computer Lab. BCPS staff also suggest that this training be used to (1) gain a common understanding of the project's underlying purpose, (2) provide instruction in the use and care of a home computer, (3) provide parents tips in how to police their children's use of the Internet, and (4) identify personal data (e.g., financial information) that are best maintained on a floppy disk (as opposed to the hard drive of a donated computer that may someday be recalled for technical problems).

Have Separate Staff Perform the Training and Technical Support Functions. The decision to use a single person for both training and technical support hindered the project's ability to provide families and teachers with timely instruction in the use of learning technologies. There are several reasons to break out these two duties across two or more staff. First, it can be difficult to find a single individual who has the mix of technical and pedagogical skills needed to perform these two distinct functions. Second, instructors will likely have difficulty focusing on their training role if they are also responsible for resolving extensive technical problems. Separating these distinct functions across two different staff might have prevented the problems that occurred when the BCPS trainer, by necessity, became focused on the need to provide technical support to families—as opposed to providing instructional support to families and pedagogical support to teachers.

Prepare Formal Agreements with Participating Schools and Families. The use of such agreements can insure that all stakeholders begin the process with common expectations.

Topics to be covered by these agreements can include Internet use policy, and type of data that are to be collected from program participants.

Configure Donated Computers So That Families Are Precluded From Adding Their Own Software. This is especially important if the donated computers are not equipped to handle a high number of software programs that require considerable memory.

Anticipate the Need to Provide Training in Basic Computer Skills. BCPS initially planned on providing extensive training in accessing and navigating the information infrastructure. As a result of their experiences, however, BCPS staff recommend that future projects emphasize training in basic computer skills (e.g., using the keyboard). This would be especially beneficial for parents.

Provide Training to Families in a Group Setting Before the Computers Are Installed in Their Homes. BCPS staff indicated that this training should be used to provide information on (1) appropriate uses for the computer, (2) how to troubleshoot and care for the computer, and (3) how to make basic repairs on home computers. When training does occur outside of the home, however, BCPS staff cautioned that families should only receive training in the actual equipment that they would eventually be using. This enables students and parents to become familiar with a particular model.

Develop Minimum Standards for the Technology That Will Be Placed in Families' Homes. These written standards can cover such issues as hardware, software, and how the computer is to be configured. They can also be used to specify what will happen if a machine breaks down or a family moves out of the project area. Finally, the guidelines can be used to delineate the types of software and personal information that families are permitted to keep on their donated computers.

Develop a Schedule of Parent Meetings, Partner Meetings, Home Visits, and Key Milestones at the Beginning of the Project. For example, prepare a calendar with required events (e.g., all home computers will be installed and working by April 1999) and milestones (e.g., by June 1999, all parents and students will be using e-mail as a communications tool). This schedule can then be used to track the progress of participating families, as well as to target technical assistance and additional training as needed.

Generate Local Media Attention About the Project. By publicizing and showcasing the project's successes, BCPS staff indicated that they could have made the students and families "feel good" about what they were doing.

H. Summary and Conclusions

The Middle Schools Online Project demonstrated the feasibility and benefits of providing donated computers to a small number of seventh grade students and their families. Our discussions with project staff and two of the participating families suggest that the project achieved its primary objectives—that is, enhancing participants' access to computers and the Internet,[6] and identifying lessons that would be of use to other communities seeking to adopt a similar approach.

The extensive equipment problems associated with this project suggests that future technology initiatives should be cautious about relying too heavily on *used* donated computers. In addition, the use of used or new donated computers should include procedures that are designed to (1) assure the quality of donated equipment *before* it is installed in a home environment and (2) handle computer-related problems in a timely and reliable manner.

The lessons learned by project staff (outlined in the previous section) are particularly useful for any technology initiatives that aim to use public schools as a vehicle for providing donated computers to low-income families. Most importantly, providing donated computers to all students in a given class (as opposed to 30 students across an entire grade) may make it easier for participating teachers to change their instructional practices—e.g., preparing special lesson plans and homework that are designed to take full advantage of the Internet and e-mail. It may also make it easier for project staff to provide training to and track the progress of participating families.

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[6] While participants did benefit from their increased access to the Internet, the extent of these benefits has yet to be fully documented.